MH engineering Co.

16075 Vineyard Blvd., Morgan Hill, CA 95037
(408) 779-7381/226-3050; Fax (408) 226-5712

Final
Flood Plain Study
For
Monterey Dynasty
10-10-12

Contents

MH engineering Co.

Flood Plain Study Description

revised 10/10/12

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"Diamond Creek"
Floodplain Study
By
MH engineering Co.
Date: 10/10/12

Overview

"Diamond Creek" is a 142 unit residential development located on Monterey Road, adjacent to West Little Llagas Creek in Morgan Hill, California.

The project is also located in an AE flood zone as mapped by FEMA on FIRM, 06085C0626H, effective May 18, 2009, thus the need for this Floodplain Study to certify that the project does not increase the upstream or downstream Base Flood Elevations (BFE).

History

FEMA mapped the floodplain in Morgan Hill in August 1988 on the NGVD 1929 elevation datum using topographic mapping prepared for the City of Morgan Hill in April of 1988. The hydraulic modeling was done by George S. Nolte and Ass. using HEC-2 programming.

Then in May of 2009, new FIRM maps were published by FEMA using the same hydraulic model as in 1988 but BFE's and profiles were raised 2.85 feet to be on the NAVD 88 datum.

MH engineering obtained the original HEC-2 hydraulic model and imported it into the more modern HEC-RAS software as the start of this floodplain study. As the locations of the original cross sections are not exactly locatable on the topo map, we have replaced the geometry in the sections in the development area and given the new sections a river station name with a decimal (.0) to distinguish from unchanged sections from the HEC-2 model. Several new developments have been completed adjacent to West Little Llagas Creek in the project vicinity and have been added as existing obstructions in the Predevelopment Model. The results are presented in the included "Diamond Creek Flood Plain Study Summery Table" under the heading "Water Surface Calculations w/New Topo and Added Sections."

In recent weeks, the SCVWD has requested that the flood plain study include a "pure" model of the original HEC-2, converted and corrected into HEC-RAS. After this conversion, a somewhat

independent study of the Diamond Creek Development was performed to evaluate the project's effects on the flood plain. The results are summarized on the included "Diamond Creek Flood Plain Study Summary Table" under the heading "Converted/Corrected HEC-2.

In order to provide the city of Morgan Hill with cumulative affects, the Butterfield Boulevard Extension Project and the Diamond Creek Project have been merged in the HEC-RAS hydraulic modeling analysis and presented herein. The Butterfield Boulevard Project CLOMR application is currently being reviewed by FEMA and the revised workmap for that application is now made part of the Diamond Creek Study.

Calculations in New Topo and Added Sections Modeling

The predevelopment hydraulic model was calibrated after several cross sections were added at locations of existing and proposed development. The goal of the calibration was to match the FEMA flood elevation published in May 2009. on the flood profiles of West Little Llagas Creek, Panel 161P and 162P (see attached). The calibration was able to be within 0.2 to 0.50 feet of the published profile BFE's.

After calibration, the existing developments (pre-Butterfield Boulevard Extension) were added such as Mill Creek, Vineyard Town Apartments and the "Teacher" Project located on Watsonville Road. This plan represents Predevelopment for Butterfield and Diamond Creek.

Calculations in Converted/Corrected HEC-2

Using the "pure" converted/corrected HEC-2 which utilizes only the obstructions and effective flow tables, section geometry and flow tables from the HEC-2 file (5012013) obtained from the SCVWD website, the effective FIS was developed, and is entitled EFF FIS in the Summery Table. Existing developments were then added as obstructions and modeled as "PRE DEV." Them Diamond Creek was added between sections RS 298 and RS 300 and modeled as "Post D.C."

Results

In the modeling with new topo and section, the post projects water surfaces are all lower than the published FIS BFE's through the project areas. Upstream of Diamond Creek (section 310) the water surface elevations are virtually the same (323.9 vs. 323.87). However in the area of Watsonville Road and Monterey Road box culverts there is a significant difference between published FIS and predevelopment water surfaces (323.5 vs. 321.94) resulting from the split flow calculations having different diversion tables. In the more accurate model w/New Topo a rating table was developed independent of the HEC-2 model. The CLOMR application in process will remedy the artificially high BFE's in this area.

In the more recent modeling of Converted and Corrected and HEC-2, the results show that Diamond Creek raises the water surface 0.07 feet and existing development has raised the water surface 0.13 feet at RS 310, for a total rise in water surface of 0.20 feet, well below the FEMA limit of 1.0 feet. With the completion of the planned bypass creek to Llagas Creek located to the east, the 1.0 allowable rise should never be an issue in the future.

Conclusion

"Diamond Creek" will be required to fill in the floodplain in order to elevate the project finish floors a minimum of one foot above the Base Flood Elevation of 323.74. The HEC-RAS modeling with new topo shows all resulting BFE's will be lower than the published FIS BFE's. With the converted and corrected HEC-2 model, the Diamond Creek influence is less than 1 inch (0.07')

Therefore no impact on the floodplain will result from the proposed Diamond Creek Project and Butterfield Boulevard Extension Project.

MH engineering Co.

Flood Plain Study Summary Table

"Diamond Creek"
Flood Plain Study Summary Table

Revised October 8, 2012

River Station	FIS Profile	Water Surface Elevations Calculations w/New Topo & Added Section			Converted/Corrected HEC-2		
	FEMA (NAVD88)	Pre Dev.	Post Butterfield	Post D.C.	EFF FIS 10-08-12	PREDEV (off)	POST D.C.
310.0	323.9	323.92	323.87	323.87	324.05	324.18	324.25
304.0	323.9	323.86	323.81	323.81	323.99	324.11	324.17
302.0	323.9	323.87	323.82	323.83	324.00	324.11	324.18
300.2	323.8	323.65	323.65	323.66			
300.0	323.8	323.32	323.31	323.32	323.74	323.87	323.93
298.2	323.8	322.84	322.83	322.83			
298.0	323.7	322.89	322.89	322.89	323.69	323.83	323.85
296.2	323.7	322.56	322.56	322.56			
296.0	323.7	322.05	321.71	321.71	323.59	323.60	323.60
294.4	323.6	322.26	322.05	322.05			
294.0	323.6	322.24	322.02	322.02	323.48	323.45	323.45
292.2	323.6	322.22	321.99	321.99			
292.0	323.5	322.18	321.94	321.94	323.45	323.43	323.43
290.0	323.5	322.12	321.79	321.79	323.38	323.36	323.36
284.0	323.3	321.85			323.34	323.33	323.33
283.9	323.3		321.62	321.62			
282.4	323.0		320.41	320.41			
282	322.5	321.56	321.55	321.55	322.89	322.87	322.87
280	322.0	321.47	320.50	320.50	322.98	322.81	322.81
278	319.5	319.78			320.06	320.06	320.06
276.8	319.4	319.70	319.63	319.63			
276	319.0	319.49	319.41	319.41	319.75	319.75	319.75

FEMA: Water surface elevations obtained from the 2009 Flood Insurance Study (FIS) Profile (Panel No. 161P and 162P)

Pre Dev. Water surface elevations obtained from Calibrated HEC-RAS model with added cross sections using City of Morgan Hill topo dated April 7, 1988 and surveyed creek topo. Existing developments since 1988 have been added to the model as obstructions

Post B.E. Pre D.C.. Water surface elevations obtained from using copy of the Pre Dev. Model and added proposed Butterfield Extension Project geometry. (Pre-development of Diamond

Post B.E. and D.C. Water surface elevations obtained from using copy of Post Butterfield Extension and adding Diamond Creek fills as obstructions. (Post-development of Diamond Creek)

Converted/ Corrected HEC-2 These are the models using section geomotry from original HEC-2 FIS. (off) indicates results from optimization of lateral structure @ R.S. 280.2 turned off and (on) indicates results when turned on, representing split flow calculations.

EFF FIS This model represents the closest representation of the converted/corrected HEC-2 into HEC RAS to date. All geometry, effective tables and obstructions match 5012013 HEC-2 file. ("Pure" model)

MH engineering Co.

HEC RAS Calculations

10-05-12

HEC - 2 (5012013) Converted / Corrected

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: PF 1

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev	EFF FIS
				(cfs)	(ft)	(ft)	
Reach-1	310	PF 1	Eff FIS 10512	1936.00	316.55	1. 324.05	
Reach-1	310	PF 1	PREDEV(opt-off)	1936.00	316.55	324.18	
Reach-1	310	PF 1	Plan01-Post D.C.	1936.00	316.55	324.25	323.9
Reach-1	307			Culvert			
Reach-1	304	PF 1	Eff FIS 10512	1936.00	315.95	323.99	
Reach-1	304	PF 1	PREDEV(opt-off)	1936.00	315.95	324.11	
Reach-1	304	PF 1	Plan01-Post D.C.	1936.00	315.95	324.17	323.9
Reach-1	302	PF 1	Eff FIS 10512	1936.00	315.75	324.00	
Reach-1	302	PF 1	PREDEV(opt-off)	1936.00	315.75	324.11	
Reach-1	302	PF 1	Plan01-Post D.C.	1936.00	315.75	324.18	323.9
Reach-1	300	PF 1	Eff FIS 10512	1936.00	315.35	323.74	
Reach-1	300	PF 1	PREDEV(opt-off)	1936.00	315.35	323.87	
Reach-1	300	PF 1	Plan01-Post D.C.	1936.00	315.35	323.93	323.8
Reach-1	298	PF 1	Eff FIS 10512	1936.00	314.35	323.69	
Reach-1	298	PF 1	PREDEV(opt-off)	1936.00	314.35	323.83	
Reach-1	298	PF 1	Plan01-Post D.C.	1936.00	314.35	323.85	323.7
Reach-1	296	PF 1	Eff FIS 10512	1936.00	314.25	323.59	
Reach-1	296	PF 1	PREDEV(opt-off)	1936.00	314.25	323.60	
Reach-1	296	PF 1	Plan01-Post D.C.	1936.00	314.25	323.60	323.7
Reach-1	294	PF 1	Eff FIS 10512	1936.00	314.05	323.48	
Reach-1	294	PF 1	PREDEV(opt-off)	1936.00	314.05	323.45	
Reach-1	294	PF 1	Plan01-Post D.C.	1936.00	314.05	323.45	323.6
Reach-1	292	PF 1	Eff FIS 10512	1936.00	314.05	323.45	
Reach-1	292	PF 1	PREDEV(opt-off)	1936.00	314.05	323.43	
Reach-1	292	PF 1	Plan01-Post D.C.	1936.00	314.05	323.43	323.5
Reach-1	290	PF 1	Eff FIS 10512	1936.00	314.05	323.38	
Reach-1	290	PF 1	PREDEV(opt-off)	1936.00	314.05	323.36	
Reach-1	290	PF 1	Plan01-Post D.C.	1936.00	314.05	323.36	323.5
Reach-1	287			Culvert			
Reach-1	284	PF 1	Eff FIS 10512	1936.00	314.05	323.34	
Reach-1	284	PF 1	PREDEV(opt-off)	1936.00	314.05	323.33	
Reach-1	284	PF 1	Plan01-Post D.C.	1936.00	314.05	323.33	323.3
Reach-1	282.2			Lat Struct			
Reach-1	282	PF 1	Eff FIS 10512	1936.00	314.05	322.89	
Reach-1	282	PF 1	PREDEV(opt-off)	1936.00	314.05	322.87	
Reach-1	282	PF 1	Plan01-Post D.C.	1936.00	314.05	322.87	322.5
Reach-1	280	PF 1	Eff FIS 10512	813.13	314.05	322.98	322.0

HEC-RAS River: RIVER-1 Reach: Reach-1 Profile: PF 1 (Continued)

Reach	River Sta	Profile	Plan	Q Total	Min Ch El	W.S. Elev
				(cfs)	(ft)	(ft)
Reach-1	280	PF 1	PREDEV(opt-off)	813.13	314.05	322.81
Reach-1	280	PF 1	Plan01-Post D.C.	813.13	314.05	322.81
Reach-1	279			Culvert		
Reach-1	278	PF 1	Eff FIS 10512	813.13	313.85	320.06
Reach-1	278	PF 1	PREDEV(opt-off)	813.13	313.85	320.06
Reach-1	278	PF 1	Plan01-Post D.C.	813.13	313.85	320.06
Reach-1	276	PF 1	Eff FIS 10512	813.13	313.75	319.75
Reach-1	276	PF 1	PREDEV(opt-off)	813.13	313.75	319.75
Reach-1	276	PF 1	Plan01-Post D.C.	813.13	313.75	319.75

EFF FIS

322.0

319.5

319.0

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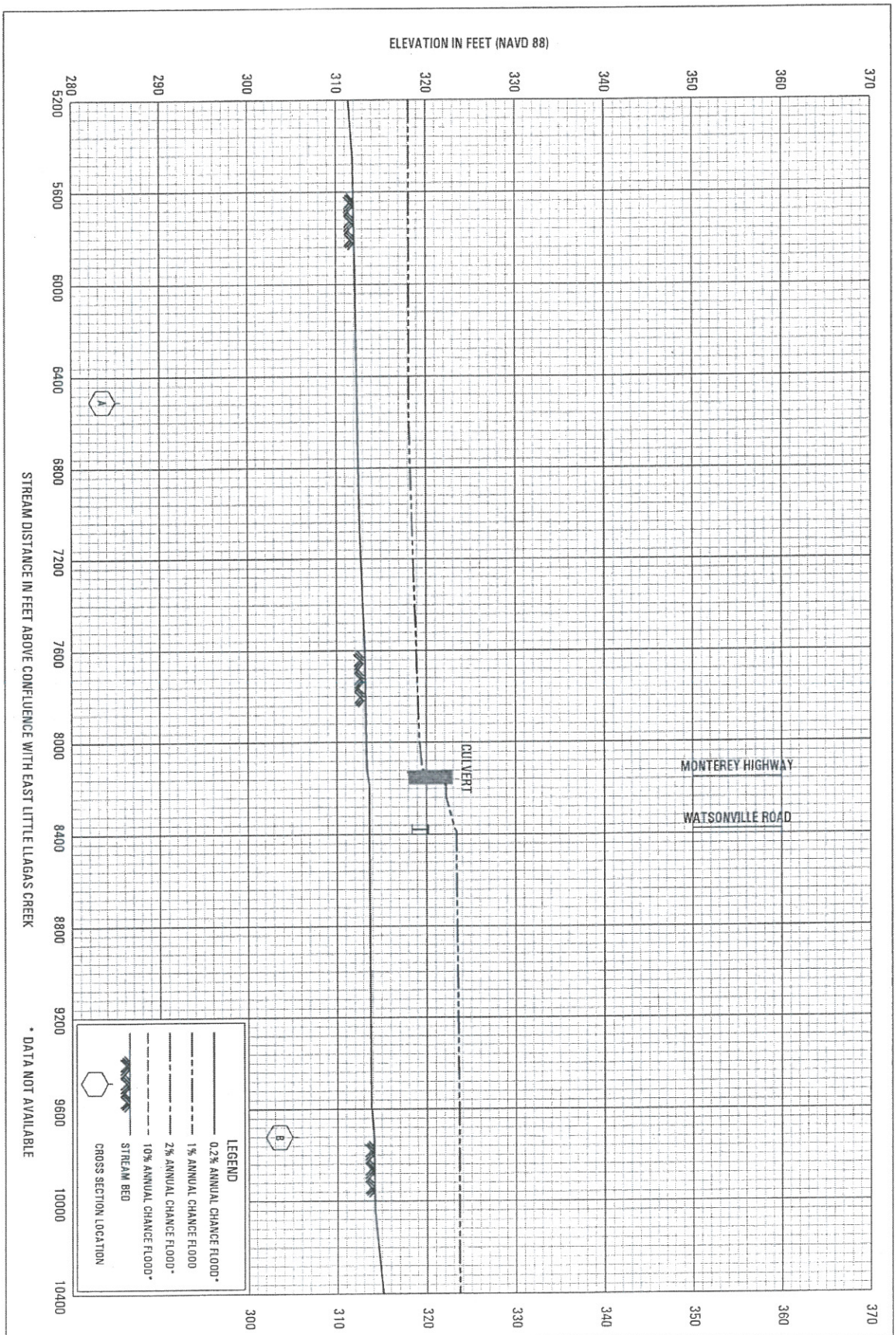
Flood Insurance Profile



161P

FEDERAL EMERGENCY MANAGEMENT AGENCY

SANTA CLARA COUNTY, CA

AND INCORPORATED AREAS

FLOOD PROFILES

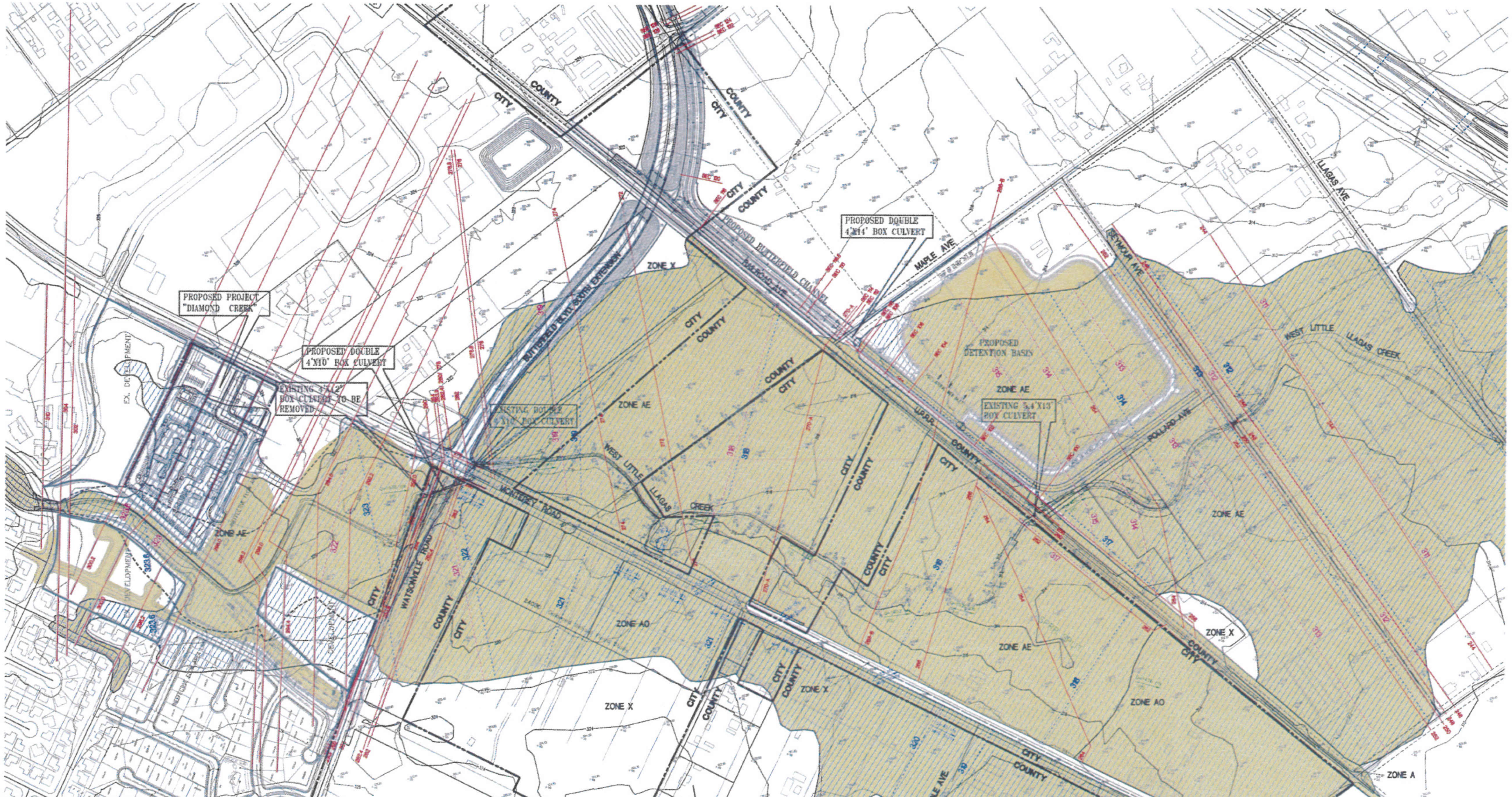
WEST LITTLE LLAGAS CREEK

MH engineering Co.

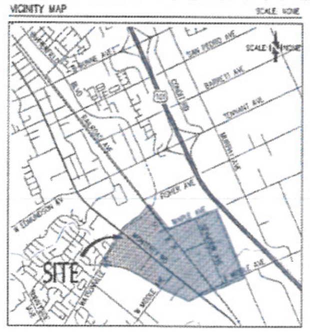
Topography Map

with

Cross Section Locations



VICINITY MAP SCALE: NONE



SCALE : 1" = 150'

LEGEND

(hatched blue)	FLOOD PLAIN LIMITS (FEMA EFFECTIVE)
(tan)	FLOOD PLAIN LIMITS (POST-DEVELOPMENT)
260	RIVER STATIONS
SEC 112	BUTTERFIELD RIVER STATIONS
322	BASE FLOOD ELEVATIONS (PRE-DEVELOPMENT)
322	BASE FLOOD ELEVATIONS (POST-DEVELOPMENT)
Q=700 FIS	FLOW-FLOOD INSURANCE STUDY(PRE-DEVELOPMENT)
Q=700 MHE Study	FLOW-MHE STUDY (POST-DEVELOPMENT)
CITY / COUNTY	JURISDICTIONAL BOUNDARY

BM 5361 (NAVD 88)
ELEVATION = 317.00
LOCATED ON TOP OF CHISELED CROSS IN A MONUMENT BOX AT THE INTERSECTION OF RAILROAD AVENUE AND MAPLE AVENUE

REGISTERED PROFESSIONAL ENGINEER WILLIAM J. McCLINTOCK No. 24693 EXP. 12-31-13 CIVIL STATE OF CALIFORNIA

CERTIFICATION: THIS IS TO CERTIFY THAT THE DATA ON THIS WORK MAP IS ACCURATE AND THE FLOODPLAIN ANALYSES HAVE BEEN COMPLETED IN ACCORDANCE WITH SOUND ENGINEERING PRACTICES, PER NFIP REGULATIONS, PART 65.2 (B).

William J McClintock 07/06/12
WILLIAM J. McCLINTOCK DATE

SEE FULL SIZE MAP ATTACHED

BUTTERFIELD BLVD. SOUTH EXTENSION AND DIAMOND CREEK PROJECT
WORK MAP

MH engineering Co.
16075 Vineyard Boulevard Morgan Hill, CA 95037 (408) 779-7381

DATE 7/12
SCALE 1"=150'
JOB NO. 26019.3
SHEET 1 OF 1

Santa Clara Valley Water District SM

5750 ALMADEN EXPWY
SAN JOSE, CA 95118-3686
TELEPHONE (408) 265-2600
FACSIMILE (408) 266-0271
www.valleywater.org
AN EQUAL OPPORTUNITY EMPLOYER

File: 29269
West Little Llagas Creek

October 22, 2012

Mr. Charlie Ha, Assistant Engineer
Development Services Center
Public Works - Engineering
17575 Peak Avenue
Morgan Hill, CA 95037-4128

Subject: Diamond Creek Floodplain Study

Dear Mr. Ha:

The Santa Clara Valley Water District (District) has reviewed the revised floodplain study submitted on October 10, 2012. The submittal included an analysis using the original FEMA FIS HEC-2, converted to HEC-RAS (with a few existing blockages added), as an existing condition (PREDEV off). This existing condition was then modified to include the development blockage for Diamond Creek at FIS cross sections 298 and 300 (Post D.C.). This analysis showed the maximum increase to be 0.07 feet. Another HEC-RAS model (EFF FIS 10-08-12) was included which was a conversion of the FEMA FIS HEC-2 to HEC-RAS without changing any cross section geometry. When compared to the FEMA FIS profile elevations the water surface elevations are a total of 0.35 feet higher in the post-project condition; however, MH Engineering's analysis shows that 0.15 feet of this increase is the result of the HEC-2 to HEC-RAS conversion of the FIS model without changing any cross section geometry. Therefore, according to MH Engineering's model, the total increase to the effective FIS water surface profiles resulting from projects constructed since the FIS model was prepared and the proposed development is 0.2 feet. This cumulative analysis did not include the Butterfield Channel improvements.

It will be the decision of the City's floodplain administrator to determine the significance of the impact, and the District recommends the City follow additional developments in this area of the West Little Llagas Creek floodplain to ensure the cumulative impact does not violate NFIP or City floodplain regulations or cause an adverse impact onto neighboring properties in the floodplain. The hydraulic analysis appears to be in accordance with standard engineering practice utilizing the information available. The District recommends the City obtain a final copy of the report signed and stamped by the registered engineer who prepared it.

If you have any questions, please contact me at (408) 630-2319, or at yarroyo@valleywater.org.

Please reference District File No. 29269 on future correspondence regarding this project.

Sincerely,

Yvonne Arroyo
Associate Engineer
Community Projects Review Unit

cc: S. Tippets, Y. Arroyo, S. Katric, File

29269_55476ya10-22

CITY OF MORGAN HILL

Memorandum
Community Development Agency

Date: October 31, 2012

To: Steve Golden, Associate Planner

From: Karl Bjarke, City Engineer

Subject: SD 09-09, EA 08-09 – Monterey Dynasty
Flood Plain Study

Based on the Final Flood Plain Study For Monterey Dynasty (AKA Diamond Creek) prepared by MH engineering and dated 10-10-12, the total increase to the FLOOD INSURANCE STUDY (FIS) water surface profiles resulting from projects constructed since the FIS model was prepared and the proposed development is 0.2 feet. The cumulative impacts does not violate the NATION FLOOD INSURANCE PROGRAM (NFIP), City floodplain regulations, or cause an adverse impact onto neighboring properties in the flood plain. Therefore, the Diamond Creek development may proceed with development per the following conditions:

1) Final grading design within the flood plain shall be in conformance with the tentative design.
2) Developer, through a registered Civil Engineer or Surveyor, shall verify by field survey and certify in writing that final grades are in conformance with the plans.
3) Prior to occupancy of any commercial or residential units. Elevations certificates shall be provided and respective FEMA LETTER OF MAP REVISION BASED ON FILL (LOMR-F) shall be filed and issued.
4) Due to the phasing of the project, it may be necessary to file multiple LOMR-F applications.

It should be noted that, concurrently, the City's Butterfield Blvd. construction project immediately to the south of Diamond Creek is processing a FEMA CONDITIONAL LETTER OF MAP REVISION (CLOMR). The resulting flood study shows that once Butterfield Blvd. is constructed there will be no adverse effects to the flood plain up stream within the Diamond Creek development.

Cc: Scott Creer, Senior Engineer
Charlie Ha, Assistant Engineer
Bill McClintock, MH engineering